भारतीय मानक **IS 3025 (Part 9) : 2023**

Indian Standard

जल एवं अपशिष्ट जल के नमूने लेने तथा परीक्षण (भौतिक एवं रसायन) की पद्धतियाँ

भाग 9 तापमान

(दूसरा पुनरीक्षण)

Methods of Sampling and Test (Physical and Chemical) for Water and Wastewater

Part 9 Temperature

(Second Revision)

ICS 13.060.60

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July 2023 **Price Group 4**

Water Quality Sectional Committee, CHD 36

FOREWORD

This Indian Standard (Part 9) (Second Revision) was adopted by the Bureau of Indian Standards after the draft finalized by the Water Quality Sectional Committee had been approved by the Chemical Division Council.

Measurements of temperature are required in studies of self-purification of rivers and reservoirs and is one of the parameters for suitability of an effluent waste discharge and for the control of waste treatment plants. Temperature of water is important in relation to aquatic biota, bathing and irrigation use. It also affects taste of water.

Accurate measurements of temperature of natural waters are essential for calculation of degrees of saturation with respect to various minerals and in study of mineral 'equilibria'. Temperature readings are used in calculation of various forms of alkalinity. In limnologic studies, temperature readings at different depths are required. In industrial plants, for process use or heat transfer calculations, temperature values are required.

The Technical Committee responsible for formulation of IS 3025 : 1964 'Methods of sampling and test (physical and chemical) for water used in industry' decided to revise the standard and publish it in separate parts. This standard was one among the different parts published under IS 3025 series of standards and superseded clause **10** of IS 2488 (Part 1) : 1966 'Method of sampling and test for industrial effluents, Part I'. The first revision of this standard was published in 1984.

In this second revision following changes have been incorporated:

a) References, ICS No. have been updated; and

b) Other editorial changes have been done to bring the standard in the latest style and format of Indian Standards.

In the preparation of this standard, considerable assistance has been derived from the method 2550 F of — Standard Methods for the Examination of Water and Wastewater, published by the American Public Health Association, Washington, USA, 23nd Edition, 2017.

The composition of the Committee responsible for formulation of this standard is given in Annex A.

In reporting the results of a test or analysis in accordance with this standard, if the final value observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'.

Indian Standard

METHODS OF SAMPLING AND TEST (PHYSICAL AND CHEMICAL) FOR WATER AND WASTEWATER

PART 9 TEMPERATURE

(Second Revision)

1 SCOPE

This standard (Part 9) prescribes method for the measurement of temperature of water and waste water.

2 REFERENCES

The following standards given below contain provisions which through reference in this text constitute provisions of this standard. At the time of publications, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of these standards:

IS No.	*Title*
IS 7022 (Part 1) : 1973	Glossary of terms relating to water, sewage and industrial effluents: Part 1
IS 7022 (Part 2) : 1979	Glossary of terms relating to water, sewage and industrial effluents: Part 2

3 TERMINOLOGY

For the purpose of this standard definitions given in IS 7022 (Part 1) and IS 7022 (Part 2) shall apply.

4 PRINCIPLE

4.1 Temperatures are measured using any standard liquid-in-glass or electronic thermometer with an analog or digital readings. The device should be able to distinguish temperature changes of 0.1 °C or less, and equilibrate rapidly (have a minimal thermal capacity). Avoid using mercury-filled thermometers as there is every possibility of releasing mercury into the environment in case of breakage. Carryout checks on the device's bias periodically (within the temperature range of use) against a reference thermometer.

4.2 Depth temperature may be obtained with a protected reversing thermometer or a thermistor. Measurements of temperature are, usually, more conveniently done using thermistors. Before every field use, carryout calibration according to specifications. Observe the readings with the thermometer or device immersed in water long enough to permit complete equilibration. Report results to the nearest 0.1 °C or 1.0 °C, depending on need.

5 PROCEDURE

5.1 Make measurement with the thermometer immersed directly in the water body, after a period of time sufficient to permit constant reading. If the measurement of water temperature cannot be carried out directly, carry it out in a sampling bottle. The bottle should have a volume of at least one litre. Adjust its temperature to that of the sample water before the measurement. Do not expose it to heat or direct solar radiation. Measure temperature of tap water in a bottle through the water flows until a constant reading is obtained.

5.2 Make measurement of the temperature of a water body at a particular depth with the thermometer or thermistor immersed directly in the water body. After sufficient time has elapsed to allow the thermometer or thermistor to come to the exact temperature of the water, take a reading. In the case of the thermistor make a direct measurement of its resistance and obtain the temperature of the water body from the calibration curve supplied with the thermistor.

5.3 In the case of reversing thermometer, obtain the reading by dropping a messenger weight along the wire to which is attached the reversing thermometer in a reversing frame on a water sampling bottle. This weight normally drops at a speed of about 150 metres per minute except when the wire is extremely inclined to the vertical. After sufficient time has passed for the messenger weight to trip the thermometer, haul up the wire and keep the water bottle with the thermometer carefully in a vertical position away from direct sunlight in order to prevent accidental reversing before reading the temperature to be measured. Allow about 10 to 15 minutes for the thermometers 'to reach the air

temperature, after they are brought up from the water. At this stage the auxiliary thermometer records the atmospheric temperature and the main thermometer, the approximate temperature of the water body.

6 CALCULATIONS

Calculate the exact temperature of the water body, in the case of the reversing thermometer, from the following formula:

$$Tw = T' + C + I \qquad \ldots(1)$$

$$C = \frac{(T' - Vo) * (T' - T1)}{(K - 100)}$$

where

Tw = the corrected value, that is, the true value of the water temperature, °C;

T' = the reading of the main thermometer, °C;

I = the index correction given on a calibration sheet supplied with the thermometer;

C = correction for thermal expansion;

V_o = volume of mercury below 0 °C mark given on the calibration graph;

K = reciprocal thermal expansion coefficient given on the calibration graph; and

T_1 = temperature reading of the auxiliary thermometer, °C.

6.1 If an unprotected reversing thermometer is used along with the protected thermometer the corrected temperature Tu can be similarly obtained. The actual depth of reversal of the thermometers can be obtained using the following equation:

$$Z = \frac{(Tu - Tw)}{(Pm - Q)} \qquad \ldots(2)$$

where

Z = depth, in m;

Tu = corrected temperature reading of the protected thermometer, in °C;

Tw = corrected temperature reading of the protected thermometer, in °C;

Pm = mean density of the water column; and

Q = pressure coefficient of the unprotected thermometer given on the calibration graph.

7 REPORT

Report the temperature of water to the nearest 0.01 °C, 0.1 °C, or 0.5 °C, depending on the accuracy required and the thermometer used.

ANNEX A

(*Foreword*)

COMMITTEE COMPOSITION

Water Quality Sectional Committee, CHD 36

Organization	*Representative(s)*
Chief Scientist, EPTRI, Hyderabad	SHRI N. RAVEENDHAR **(*Chairperson*)**
Andhra Pradesh Pollution Control Board, Vijaywada	SHRIMATI M. SREERANJANI SHRIMATI A. SRI SAMYUKTHA (*Alternate*)
Bhabha Atomic Research Centre, Mumbai	DR S. K. SAHU SHRI I. V. SARADHI (*Alternate*)
Bureau of Indian Standards, New Delhi	MS NITASHA DOGER
Central Institute of Mining and Fuel Research, Dhanbad	DR (MRS) BABLY PRASAD DR ABHAY KUMAR SINGH (*Alternate*)
Central Pollution Control Board, New Delhi	SHRI P. K. MISHRA SHRI VISHAL GANDHI (*Alternate*)
Confederation of Indian Industry, New Delhi	DR KAPIL K. NARULA DR SIPIKA CHAUHAN (*Alternate*)
Delhi Jal Board, New Delhi	SHRI ASHUTOSH KAUSHIK
Department of Civil Engineering, IIT Madras	DR LIGY PHILIP DR S. MATHAVA KUMAR (*Alternate*)
Envirocare Laboratories Pvt Ltd, Thane	DR PRITI AMRITKAR SHRI NILESH AMRITKAR (*Alternate*)
Gujarat Pollution Control Board, Gandhinagar	DR D. N. VANSADIA SHRI K. B. VAGHELA (*Alternate*)
Haryana State Pollution Control Board	SHRI JATINDER PAL SINGH
Himachal Pradesh State Pollution Control Board, Govt of Himachal Pradesh	DR T. B. SINGH ER PRAVEEN GUPTA (*Alternate*)
Indian Agricultural Research Institute – Water Technology Centre, New Delhi	DR KHAJANCHI LAL DR RAVINDER KAUR (*Alternate*)
Indian Chemical Council, Mumbai	SHRI J. I. SEVAK DR MRITUNJAY CHAUBEY (*Alternate* I) DR N. D. GANGAL (*Alternate* II)
Indian Institute of Chemical Technology, Hyderabad	DR SUNDERGOPAL SRIDHAR DR NIVEDITA SAHU (*Alternate*)
Indian Institute of Toxicology Research, Lucknow	DR S. C. BARMAN DR SATYAKAM PATNAIK (*Alternate*)
Indian Water Works Association	SHRI VIJAY CHARHATE

Organization	*Representative(s)*
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Maharashtra State Pollution Control Board, Mumbai	DR V. R. THAKUR SHRI S. C. KOLLUR (*Alternate*)
Ministry of Environment and Forest & Climate Change	DR SONU SINGH
Ministry of Jal Shakti Department of Drinking Water and Sanitation	SHRI D. A. RAJASEKHAR SHRI SUMIT PRIYADARSHI (*Alternate*)
National Environmental Engineering Research Institute, Nagpur	DR NOOR A. KHAN
National Institute of Oceanography, Vishakhapatnam	DR V. V. S. S. SARMA DR DURBAR RAY (*Alternate*)
NTPC Ltd, New Delhi	DR VIJAY PRAKASH SHRI HARIKRISHNA SURARAPU (*Alternate*)
Shriram Institute for Industrial Research, New Delhi	DR VIVEK NARAYAN SINGH DR JAGDISH KUMAR (*Alternate*)
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BIS Directorate General	SHRI AJAY KUMAR LAL, SCIENTIST 'F'/SENIOR DIRECTOR AND HEAD (CHEMICAL) [REPRESENTING DIRECTOR GENERAL (*Ex-officio*)]

Member Secretary
MS SHUBHANJALI UMRAO
SCIENTIST 'B'/ASSISTANT DIRECTOR
(CHEMICAL), BIS

Bureau of Indian Standards

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Review of Indian Standards

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